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Knowledge flow in Technological Business Incubators: Evidence from Australia and Israel

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ABSTRACT

The study of the contribution of incubators to economic growth started to gain momentum in the 1980s, following the growth of the incubation phenomenon. While acknowledging the challenge of evaluating incubators' outcomes, we shift the focus from incubators' performance to their internal processes, in particular, the interrelationships through which the incubator stakeholders share knowledge. The literature suggests that small new ventures tend to fail because they lack managerial experience and ability to raise capital in an early stage. Incubators are expected to overcome these obstacles by offering experienced monitoring skills and by enhancing access to capital at a firm's early stage. However, empirical results of incubators' ability to perform their role are often contradictory, making policy makers question their effectiveness. We provide evidence from Australian and Israeli incubators. Our findings suggest that collaborations between incubatees, graduated incubatees, and incubator management increase the incubatees' knowledge of technology and market in both countries. Collaboration between incubatees and incubator management also increase incubatees' financial knowledge and their likelihood of raising capital. We also found that universities played a modest role as a source of new ideas for incubatees, but a more important role in later stages of incubatees' new product development processes.

1. Introduction

The study of the contribution of Technological Business Incubators (BIs) to economic growth started to gain momentum in the 1980s, following the growth of the business incubation phenomenon (Smilor and Gill, 1986; Temali and Campbell, 1984). In the 1990s the majority of studies analyzed data from the US, where technology clusters and technopoles evolved around technology generators such as universities, national laboratories, private research and development (R&D) laboratories and other high-tech enterprises (Markley and McNamara, 1995; Sherman and Chappell, 1998). In recent years an increasing number of studies have been conducted outside the US. For example Bøllingtoft (2012), Carayannis and von Zedtwitz (2005), Clausen and Korneliussen (2012), Kim and Ames (2006), Malek et al. (2014), Peña (2004), Ratinho and Henriques (2010), Sofouli and Vonortas (2007), Totterman and Sten (2005) and VonZedwitz and Grimaldi (2006) provide evidence from Canada, Denmark, Greece, Italy, Korea, Norway and Portugal.

In a broad sense, the literature suggests that firstly, small new ventures tend to fail because they lack managerial experience and ability to raise capital at an early stage (Allen and Rahman, 1985; Smilor and Gill, 1986). BIs stimulate the innovation process by creating a bridge between these market failures and improving access to capital at a firm's early stage, (Allen and McCluskey, 1990; Smilor and Gill, 1986; Tornatzky et al. 1996). Secondly, although the literature acknowledges the existence of knowledge transfer barriers (e.g., Hall et al., 2001; Siegel et al., 2003a), it also acknowledges the knowledge spillover from government funded research institutions to absorptive entities – high tech firms that reside in proximity to universities, some of whom are associated with BIs.

In part because universities have transformed from being conventional research and education hubs to being innovation promoting knowledge hubs (Youtie and Shapira, 2008), most of the readily available BI research arguably put the university in the center of their studies, and focus on the University–Industry Technology Transfer (UITT) where knowledge is transferred from universities to the individual firms inside incubators (hereafter called incubatees) (Debackere and Veugelers, 2005; Lumpkin and Ireland, 1988). However, as argued by Rothschild and Darr (2005) this research approach is insufficient because a university is only one of several

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potential knowledge sources for incubatees. Other external sources such as consultancy firms, customers and graduated incubatees may also have the potential to serve as significant knowledge sources. A growing body of literature acknowledges this variety of knowledge sources (Malek et al., 2014), and the networking behavior and collaboration practices of incubatees are increasingly often suggested to explain their success (Bøllingtoft, 2012; Ebbers, 2014). At the same time the importance of BIs' ability to provide incubatees with valuable networks is increasingly acknowledged (Peters et al., 2004; Schwartz and Hornych, 2008).

However, there is a lack of in-depth studies examining the different knowledge agents that surround the incubators, and the nature of knowledge that flows between these knowledge agents and incubatees (Bøllingtoft, 2012; McAdam and McAdam, 2006). The existing studies in this area typically rely on survey data and have a narrow focus on technological knowledge flows, particularly from universities (McAdam and McAdam, 2006). In this article, we aim to contribute in filling this gap in the literature by acknowledging that a university is only one potential source of knowledge for incubatees, and also by exploring the nature of other types of knowledge flows experienced by incubatees. As a consequence we ask the following explorative research question:

RQ: What is the nature of the knowledge that flows through the endogenous and exogenous interrelationships experienced by incubatees?

To explore this question we analyze BIs in Israel and Australia. These two OECD countries differ in their public/private knowledge sectors and in their incubation working models and government support. Consequently, Israeli and Australian BIs work in quite different environments. The Israeli high-tech industry is the most successful instance of the Silicon Valley diffusion model outside of North America (De-Fontenay and Carmell, 2004). It is ranked first among OECD countries in its business expenditure on R&D per GDP and it has higher ratio of VC investment to GDP than any other OECD country (Baygan, 2003). However, it has a declining R&D funding for its higher education sector. Australia is lacking in private investment in R&D. However, its higher education sector is a major R&D funding sector (Collier, 2007; Garrett-Jones et al., 2005), and it is ranked 5th among OECD countries, which makes this sector a major source of research activities (Australian Bureau of Statistics, 2008).

Regarding the differences in incubator models and government policies to promote incubators, Israel has the Technology Incubation Program (TIP) that was established in 1991 and has expanded significantly since, while Australia has no coordinated technology incubation program. In these two countries different incubation models are applied. Israeli incubator managements typically invest in their firms and provide very close monitoring services (even after the incubatee graduates), while Australian incubator managements are mostly providing a portfolio of services and charge the tenants for the services. They typically hold little or no equity in their firms.

The rest of this article is arranged in the following manner: we first provide the theoretical background for our empirical inquiry, by reviewing the relevant research literature. Following the review, we describe our research method, including the selected cases. In the following section we present our empirical findings. Our findings are then discussed in light of existing literature and based on this discussion we offer five propositions and an incubator interrelationship model that should be the basis for future research.

2. Literature review

Studies that analyze incubators can be grouped into two general areas. The first is studies of incubator performance and the second is studies of the internal processes within incubators. The first area is more common and it is often used by policy makers to evaluate incubators' impact in terms of knowledge and job creation. However, the second method is favoured by the authors, in part due the challenges of measuring incubator performance (Bergek and Norrman, 2008), but primarily due to the literature gap related to the incubation process itself (Hackett and Dilts, 2004b). In particular empirical research focusing on both technological and non-technological knowledge flows between incubators, incubatees and other entities is lacking (Bøllingtoft, 2012). We now review the parts of the literature that are relevant in relation to our research question.

2.1. Characteristics of BIs

It is agreed that a BI's major goal is to stimulate entrepreneurship and help incubatees in their early stages. The National Business Incubation Association (NBIA) defines BIs as a catalyst tool for economic development which provides entrepreneurs with a range of business resources and services (NBIA, 2007). Services provided by BIs are typically access to co-located premises at a low-priced rent (e.g., Hackett and Dilts, 2004b), access to networks (e.g., Peters et al., 2004), assistance in developing business and marketing plans (e.g., Grimaldi and Grandi, 2005), management assistance (e.g., Peters et al., 2004), administrative services (e.g., Grimaldi and Grandi, 2005), as well as financial services (e.g., Bøllingtoft, 2012). However, the services provided by incubators vary. Bruneel et al. (2012), for example, showed that old generation incubators tend to provide fewer services to their incubatees than new generation incubators.

This heterogeneity of incubator services gives rise to different incubator model classifications (Grimaldi and Grandi, 2005). Examples of how incubators have been categorized include:

- NBIA (2007) categorized incubators in five categories: for-profit property development ventures, non-profit development corporations, academic institutions, venture capital firms, and hybrids of the above.
- VonZedwitz and Grimaldi (2006) classified the incubators by looking at the services they provide namely: university, regional business, company-internal, independent commercial and virtual incubators.
- McKinnon and Hayhow (1998) classified business incubators into four categories that relate both to the services they provide and the incubatees' field of work: manufacturing incubators, technology incubators, targeted incubators (which assists start-ups from a specific industry), and mixed-use incubators that does not focus on a particular industrial sector.
- Grimaldi and Grandi (2005) classified incubators into four categories: business innovation centers; university business incubators; independent private incubators; and corporate private incubators.
- Etzkowitz (2001) divided incubators into university incubators and network incubators (with inter-networking and extra-networking).

The literature also suggests that the objectives of incubators vary. Bøllingtoft and Ulhoi (2005), for example, focused on the 'networked incubator', which was a for-profit collaborative incubator type, and suggested that the main objective of this incubator type was job creation. Another example is Allen and McCluskey (1990) who focus on not-for-profit incubators and suggest that the objective of these incubators is mainly related to regional development.

Typically BIs also have specific regional adaptations, in terms of organizational structures, operation policies and institutional affiliations, in order to fit into local needs (Kuratko and LaFollette, 1987). For example, in Belgium and Spain, the incubators' objective is often to attract branches of multinational firms, in Germany, incubators